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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/817,208	04/02/2004	Corbin L. Champion	200312369-1	2402
22879	7590	06/24/2005		
HEWLETT PACKARD COMPANY P O BOX 272400, 3404 E. HARMONY ROAD INTELLECTUAL PROPERTY ADMINISTRATION FORT COLLINS, CO 80527-2400			EXAMINER LARKIN, DANIEL SEAN	
			ART UNIT 2856	PAPER NUMBER

DATE MAILED: 06/24/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/817,208

Applicant(s)

CHAMPION ET AL.

Examiner

Daniel S. Larkin

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-6, 8-15, and 18-20 is/are rejected.
- 7) ☒ Claim(s) 7, 16, 17 and 21 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 April 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)               | Paper No(s)/Mail Date. ____   |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>02 April 2004</u>   | 6) <input type="checkbox"/> Other: ____                                     |

## DETAILED ACTION

### *Drawings*

1. The drawings are objected to because of the following:

Figure 2: The top drawing of Figure 2 should be labeled -- FIG. 2A --.

Figure 2: The bottom drawing of Figure 2 should be labeled -- FIG. 2B --.

Figure 2, top drawing: Reference designation "I2" should be corrected to read -- I1 --, as described in the disclosure on page 4, paragraph [0022], lines 4-7.

Figure 2, bottom drawing: Reference designation "I1" should be corrected to read -- I2 --, as described in the disclosure on page 5, paragraph [0023], lines 3-6.

2. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner,

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the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Specification***

3. The disclosure is objected to because of the following informalities:

Page 2, paragraph [0010], line 1: Reference designation "Fig. 2" should be corrected to read -- Figs. 2A and 2B --.

Page 4, paragraph [0022], line 2: Reference designation "2" should be corrected to read -- 2A --.

Page 5, paragraph [0023], line 1: The phrase--, as shown in Fig. 2B -- should be inserted after the term "probe".

Page 5, paragraph [0024], line 6: Reference numeral "26" should be corrected to read -- 32 --. Appropriate correction is required.

### ***Claim Objections***

4. Claims 11-17 are objected to because of the following informalities:

Re claim 11, claim line 4: The conjunction -- and -- should be inserted. Appropriate correction is required.

***Claim Rejections - 35 USC § 112***

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 3, 4, and 8 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Re claim 3: The phrase a "sensing device to detect the current flow through the variable resistance between the probe and the storage medium " does not make sense.

Re claim 8, claim lines 2-4: The phrase "a sensing circuit to detect a current flow through the probe, variable resistance, storage medium, and electrical conductor that is dependant upon the variable resistance" does not make sense. The current flow through the variable resistance is measured?

***Claim Rejections - 35 USC § 102***

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

8. Claims 1, 2, 5, and 10-15 are rejected under 35 U.S.C. 102(e) as being anticipated by US 2004/0113641 (Birecki et al.)

The applied reference has a common assignee with the instant application.

Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

With respect to the limitations of claims 1 and 5, the reference to Birecki et al. discloses a storage device, comprising: a contact probe (112) having a carbon nanotube tip; and a storage medium (114), the storage medium being electrically conductive and electrically contacted to the tip, wherein the tip is adapted to form a dent in the storage medium, page 1, paragraph [0013], wherein the tip is adapted to cooperate with the storage medium to provide variable resistance based on whether the tip is engaged in the dent, page 1, paragraph [0013], lines 7 and 8; and page 2, paragraph [0017], lines 1-9.

With respect to the limitation of claim 2, the reference discloses that the resistance changes when the probe encounters a dent. The examiner argues that the resistance of the probe within the dent inherently would be less than the resistance of the probe when outside of the dent, on the surface of the layer. Since when a probe travels over a hole a short occurs between the tip and the conductive layer, the voltage applied to the tip would decrease, which in turn would cause a decrease in resistance as well.

With respect to the limitation of claim 10, the reference discloses that the tip is heated to form the dent.

With respect to the limitations of claim 11, the reference discloses a system comprising: a processor/read circuit (124); and a storage device (114) coupled to the processor/read circuit (124), the storage device comprising: a probe (112) having an electrically conducting carbon nanotube tip; a storage substrate (116) having an electrically conductive layer (120) electrically contacted to the tip, the tip adapted to form dents (122) in the electrically conductive layer (120), the tip to with the electrically conductive layer (120) to provide a signal path having a variable resistance based on whether the tip is engaged in a dent, page 1, paragraph [0013], lines 7 and 8; and page 2, paragraph [0017], lines 1-9.

With respect to the limitation of claim 12, the reference discloses that the resistance changes when the probe encounters a dent. The examiner argues that the resistance of the probe within the dent inherently would be less than the resistance of the probe when outside of the dent, on the surface of the layer. Since when a probe travels over a hole a short occurs between the tip and the conductive layer, the voltage applied to the tip would decrease, which in turn would cause a decrease in resistance as well.

With respect to the limitations of claim 13, the surface area of the tip in contact with the conductive layer will be greater when the tip is in the dent as opposed to traveling on the top surface of the layer.

With respect to the limitation of claim 14, the reference discloses that the probe tip can be a carbon nanotube, which is a nanotechnology structure.

With respect to the limitations of claim 15, the reference discloses that the single probe is only illustrated; however, an array of probes may be used.

***Claim Rejections - 35 USC § 103***

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claims 1-3, 5, 6, and 10-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 6,762,402 (Choi et al.).

With respect to the limitations of claim 1, the reference to Choi et al. discloses an apparatus for recording and reading data, comprising: a contact probe (32) having a tip (31) and a storage medium, the storage medium being electrically conductive (34) and electrically contacted to the tip (31), wherein the tip is adapted to form a dent in the storage medium, page 1, col. 4, lines 57-65, wherein the tip is adapted to cooperate with the storage medium to provide variable resistance based on whether the tip is engaged in the dent, col. 3, lines 45-51. Specifically, it is the examiner's position that since output voltage is reduce to 0 volts when the probe engages the hole, assuming the current remains constant, the resistance would have to fall to decrease satisfy the equation  $V = IR$ .



With respect to the limitation of claim 2, the reference discloses that the output voltage reduces as the tip encounters a hole (38). Given that the equation  $V = IR$  must be satisfied, then assuming current remains constant, the resistance of the probe would decrease in line with the output voltage. Since the reference discloses that voltage decrease with contact of a hole, then it is the examiner's position that the resistance is less when a hole is encountered as compared to when the probe is traveling across the surface of the dielectric layer (33).

With respect to the limitation of claim 3, the reference discloses that a current is applied to the probe to create a hole in the dielectric layer (33). While the reference fails to disclose means for measuring the current, the examiner argues that some means would appear to be inherent in order to provide a reading of the correct amount of current necessary to heat the probe in order to melt the layer (33). With knowing the correct amount of current to apply, one either risks not providing enough current to heat the probe, or wasting energy by providing too much current. Providing means to measure the current insures that one knows the correct the amount of current.

With respect to the limitation of claim 5, the reference appears to show that more of the probe tip is in electrical contact with the conductive layer when the tip is engaged in the hole (38).

With respect to the limitation of claim 6, the reference discloses circuitry to apply a voltage to the probe, and that the electrical resistance is between the probe and the conductive layer.

With respect to the limitation of claim 10, the reference discloses that the tip is heated to form the dent..

With respect to the limitations of claim 11, the reference to Choi et al. discloses an apparatus for recording and reading data, comprising: a processor/recording device; a storage device coupled to the processor/recording device, the storage device comprising: a probe (32) having an electrically conductive tip (31); and a storage substrate having an electrically conductive layer (33') contacted to the tip (31), the tip adapted to form dents in the electrically conductive layer (33'), the tip to interact with the electrically conductive layer (33') to provide a signal path having a variable resistance based on whether the tip (31) is engaged in a dent (38), col. 3, lines 45-51.

Specifically, it is the examiner's position that since output voltage is reduce to 0 volts when the probe engages the hole, assuming the current remains constant, the resistance would have to fall to decrease satisfy the equation  $V = IR$ .

With respect to the limitation of claim 12, the reference discloses that the output voltage reduces as the tip encounters a hole (38). Given that the equation  $V = IR$  must be satisfied, then assuming current remains constant, the resistance of the probe would decrease in line with the output voltage. Since the reference discloses that voltage decrease with contact of a hole, then it is the examiner's position that the resistance is less when a hole is encountered as compared to when the probe is traveling across the surface of the dielectric layer (33).

With respect to the limitation of claim 13, the reference appears to show that more of the probe tip is in electrical contact with the conductive layer when the tip is engaged in the hole (38).

11. Claims 9 and 18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 6,762,402 (Choi et al.) in view of US 5,835,477 (Binnig et al).

With respect to the limitations of claim 9, the reference to Choi et al. discloses all of the limitations of the base claim; however, the reference to Choi et al. fails to disclose a plurality of probes and a storage medium having a plurality of storage cells.

The reference to Binnig et al. discloses mass-storage applications of local probe arrays, comprising: a probe array (72) with a plurality of probes (73) situated opposite to a storage medium (70) having a plurality of storage fields (71). Providing a plurality of probes would have been obvious to one of ordinary skill in the art as a means of more quickly reading and writing data to the storage medium. As providing storage cells, this feature would have been obvious to one of ordinary skill in the art as a means of providing the reading and writing perturbations in an orderly fashion where they can be quickly accessed.

With respect to the limitations of claim 18, the reference to Choi et al. discloses a method of recording and reading data, comprising the steps of: writing to a storage medium by forming dents/holes (38) in the storage medium with a probe, wherein the storage medium is formed at least in part by an electrically conductive layer (33') ; electrically contacting an electrically conductive tip (31) of a probe (32) to the storage

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medium; and during a read, detecting a resistance value of a signal path having a variable resistance based on whether the electrically conductive tip (31) of the probe (32) is engaged in a dent/hole (38) in the storage medium, col. 3, lines 45-51.

Specifically, it is the examiner's position that since output voltage is reduce to 0 volts when the probe engages the hole, assuming the current remains constant, the resistance would have to fall to decrease satisfy the equation  $V = IR$ . The reference to Choi et al. fails to disclose the use of storage cells within the storage medium.

The reference to Binnig et al. discloses mass-storage applications of local probe arrays, comprising: a probe array (72) with a plurality of probes (73) situated opposite to a storage medium (70) having a plurality of storage fields (71). Providing storage cells, would have been obvious to one of ordinary skill in the art as a means of providing the reading and writing perturbations in an orderly fashion where they can be quickly accessed.

With respect to the limitation of claim 19, the reference to Choi et al. discloses that the output voltage reduces as the tip encounters a hole (38). Given that the equation  $V = IR$  must be satisfied, then assuming current remains constant, the resistance of the probe would decrease in line with the output voltage. Since the reference discloses that voltage decrease with contact of a hole, then it is the examiner's position that the resistance is less when a hole is encountered as compared to when the probe is traveling across the surface of the dielectric layer (33).

With respect to the limitation of claim 20, the reference to Choi et al. discloses that the probe scans the surface of the storage medium; therefore, some means for

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moving the storage medium and/or the probe with respect to the other must be provided. Furthermore, the reference to Binnig et al. discloses moving the whole probe array with respect to the storage medium, col. 5, lines 30-36.

### ***Allowable Subject Matter***

12. The following is a statement of reasons for the indication of allowable subject matter:

Prior art was not relied upon to reject claims 4, 7, 8, 16, 17, and 21 because the prior art fail to teach and/or make obvious the limitations of the above cited claims in combination with all of the limitations of the base claim and any intervening claims.

### ***Conclusion***

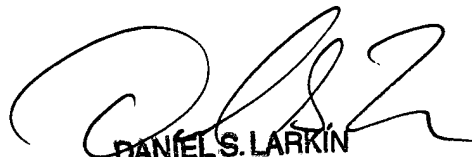
13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daniel S. Larkin whose telephone number is 571-272-2198. The examiner can normally be reached on 8:00 AM - 5:00 PM Mon-Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hezron Williams can be reached on 571-272-2208. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Daniel Larkin  
AU 2856  
22 June 2005



**DANIEL S. LARKIN**  
**PRIMARY EXAMINER**